ON THE PACIFIC SPECIES OF CAULOLATILUS.

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In the Proc. Acad. Nat. Sci., Phila., 1865, pp. 66-68, Dr. Gill enumerates four species of his genus *Caulolatilus*, one of them, *C. chrysops* (*Latilus chrysops*, Val.) from the Atlantic, the others from the Pacific Ocean.

These species are: *C. anomalus* (=*Dekaya anomalus*, Cooper), *C. princeps* (=*Latilus princeps*, Jenyns), *and C. affinis*, Gill. The first and second of these are stated to differ in the proportion between the length of the posterior dorsal spines and the distance between the dorsal fin and the lateral line; as well as in the length of the pectoral; while the third species (characterized from a specimen about three inches long) is described as follows: "Profile quadrant, in front almost vertical; Greatest height less than four times (.27) in the length (exclusive of the caudal), that of caudal peduncle about nine times. Head more than $\frac{3}{10}$ of the length, while its height is to its length as $22\frac{1}{2}$: 31. Diameter of eye equal to almost $\frac{1}{2}$ the height of the head. Preorbital very narrow. Teeth of preoperculum strong and distant; those of the middle directed obliquely upwards. Sixth dorsal spine equal to $\frac{1}{5}$ of the length. Anus behind the middle of the length. Caudal rather exceeding the height of the head. Pectorals equal to $\frac{1}{5}$ of the length. Ventrals shorter (.18) inserted beneath the base of the pectoral, its spine at the vertical of the upper axil. D., vii, 25. A., ii, 22. P., 18. Color reddish brown on head and back, lighter on the sides. A very distinct blackish spot above the axilla of the pectoral. Locality, Cape St. Lucas." Dr. Gill states his belief that the large eyes and the narrow preorbital are characters of youth; and, moreover, hints a doubt as to the specific identity of *C. princeps* and *C. anomalus*, but thinks it scarcely probable on account of the few species known to be common to Lower California and the Galapagos, the localities from which the types of *C. anomalus* and *C. princeps* were respectively procured.

As I have lately obtained two individuals of a species of *Caulolatilus* in the markets of San Francisco, I contribute a tolerably full description, embodying the characters of the two (which evidently belong to the same species) and notes upon the peculiarities of each. The difference in some of the proportions

between these two individuals has almost convinced me of the identity of *C. princeps* and *C. anomalus*; and I am inclined to think it probable that the type of *C. affinis* is only a somewhat abnormal specimen of the same species. The chief differences between the smaller of my specimens and the type of *C. affinis* are the more quadrantiform outline and greater length of the head and the smaller number of dorsal spines and anal rays in the latter.

As, however, the form of the head differs so considerably in individuals evidently belonging to the same species, too much stress must not be laid on the former character; and the variation in the number of dorsal spines (viii-ix) and dorsal and anal fin-rays in specimens of undoubted *C. anomalus* on record, forbid us to think the latter a positive character.

It is quite possible that an individual may have acquired the form of head of the adult, while still of small dimensions. The dorsal spine may be expected (judging from the two specimens here described) to increase in their proportional length inversely to the size of the fish.

If my conjecture be correct (and I only give it as a conjecture), then there is only one Pacific species at present known, ranging at least from the Galapagos to the Bay of Monterey, near San Francisco; representing in this ocean the *C. chrysops* of the Atlantic, and varying somewhat according to age and locality. To thoroughly settle the question, a thorough examination of several specimens from the Galapagos, and a comparison of them with others from Lower and Upper California, will be necessary.

Presuming, for the occasion, that they are identical, the synonymy will be as follows:

Caulolatilus princeps (Jenyns), Gill.

Latilus princeps, Jenyns, Zool. Beagle, 52, pl. 11.
Latilus princeps, Günther, Cat. Fish. British Museum, II, p. 253.
Dekaya anomala, Cooper, Proc. Acad. Nat. Sci. Phil., 1865, p. 68.
Caulolatilus anomalus, Gill, Proc. Acad. Nat. Sci., Cal., 1865, p. 68.
Caulolatilus affinis, Gill, loc. cit.
Caulolatilus anomalus, Streets, Bull. U. S. Nat. Mus., No. 7, p. 48, 1877.

D. viii-ix, 25-26. A. ii, 24-26. P. 19-20. V. $\frac{1}{5}$. C. ac. 13-14. C. 13.

General Description.—Profile more or less decurved, the curvature increasing with age; posterior portion of dorsal outline nearly straight; abdominal outline regularly curved. Greatest

depth slightly less than four to rather more than fives times in the total length; head, $4\frac{3}{4}$–$4\frac{5}{9}$ in the same. Greatest thickness about $2\frac{1}{3}$ in the greatest depth. Eye, 4–5 times; snout, 3–$3\frac{1}{3}$ times in the length of the head. Interorbital width, measured round the curve of the forehead, $2\frac{1}{7}$–$2\frac{5}{7}$ in the same. Caudal peduncle, 3–4 times in the greatest depth. Distance from the spinous dorsal to the lateral line, $1\frac{1}{5}$–$1\frac{1}{5}$ times in the height of the last dorsal spine. Nostrils conspicuous, on the horizon of the centre of the pupil, anterior with a valve posteriorly; posterior larger, simple, subcircular, distant from the eye about one-third of the diameter of the latter.

Eyes large, lateral, subcircular, their posterior margin nearer the tip of the operculum than that of the snout.

Mouth slightly ascending forwards; tip of the intermaxillary level with the lower margin of the orbit; posterior extremity of maxillary nearly vertical with the anterior orbital margin. Maxillary narrow throughout, its posterior portion free, but the greater part of its upper edge concealed behind the large preorbital in the closed mouth. Jaws equal in front in the closed mouth. Teeth in jaws in several rows in front, diminishing to a single row farther back on the sides, rather small, slender, acute, recurved at tip, but those in front of the mandible in the outer row inclined forwards. Teeth in front largest, those on the sides diminishing, but the hindermost tooth on each side of each jaw more or less developed as a canine, though still shorter than the anterior teeth.

No teeth on vomer or palatines. Upper pharyngeals set with sharp, irregularly spaced, cardiform teeth; lower pharyngeals with an outer and inner row of similar teeth, with some irregularly placed teeth between the rows. Lower pharyngeals entirely separate.

Gill-rakers of front of first branchial arch slender, rather stiff, about $\frac{1}{3}$ the diameter of the eye, all the others tubercular.

Hinder border of preoperculum vertical, very slightly curved, lower angle rounded, set with teeth which slightly increase in size at the angle, but do not extend along the lower border. Operculum ending behind in a broad flat spine.

Dorsal commencing above the upper pectoral axil, very long, the tips of its terminal rays reaching the caudal accessories; the length of its base about half the total length of the fish; spinous dorsal $3\frac{2}{3}$–4 times in the total length of the fin, and lower than the soft portion. First dorsal spine shortest, the others increasing rapidly to the fifth, more slowly to the eighth or ninth; the longest $6\frac{1}{4}$–8 times in the total length of the fin.

Soft dorsal continuous with the spinous portion, and almost equal in height throughout, the last ray excepted. Last ray much shorter than the others. Height of soft dorsal, in front $5\frac{1}{2}$–$7\frac{2}{3}$ times in the total length; many of the rays simple, some slightly bifurcate at the tip, the two or three last rays twice branched.

Anal commencing under fifth dorsal ray, its length about $\frac{2}{3}$ of that of the dorsal, with which it is coterminous. Anal spines very small, closely adpressed to the first rays; rays similar and about equal in length to those of the dorsal, the last much shorter than the others. Pectoral lanceolate, the seventh ray longest, the rays decreasing rapidly on each side, the lowest scarcely one-fifth as long as the seventh. Length to tip of longest ray $1\frac{1}{7}$–$1\frac{1}{5}$ in that of the head. Most of the rays twice branched, tip of the longest reaching a little beyond the anus. Base of pectoral slightly oblique.

Ventrals inserted under the hinder margin of the pectoral base, their tips not reaching to the anus; their length about $\frac{2}{3}$ that of the pectoral; the last four rays twice bifurcate.

Caudal about one-sixth of the total length, with numerous accessory rays, causing a widening of the caudal base; principal rays three times forked; hinder border deeply and triangularly emarginate, almost forked.

Lateral line indistinct, tubes simple; about 145 scales in its length, parallel or nearly so with the dorsal outline.

About forty scales between the ventrals and the lateral line, and thirteen above the latter. Scales of body almost rectangular, their longitudinal exceeding the transverse diameter, the free margin finely ctenoid. All the scales small, those of the abdomen rather smaller than the others, especially front of the paired fins.

Scales extending upon the cheeks and opercular apparatus, but the snout and forehead to above the centre of the eyes, the upper border of the orbits; preopercular margin, jaws and gill-membrane scaleless.

No scales upon dorsal or anal; caudal covered with small scales over the greater portion of its surface. Pectorals more or less scaly exteriorly near the base, the scales extending farther between the central than between the lateral rays.

Color leaden-gray, becoming darker above, but fading to a dirty creamy-white below. Vertical fins slaty-gray. Dorsal surface of head darker than the rest of the body.

The two specimens on which the above description is principally founded were procured in the market of San Francisco, and were brought from the vicinity of Monterey Bay. One is an adult, the other an immature individual, and the two present considerable variation in external form, and in the proportions of some of the parts, as will be evident by the dimensions and further description of each specimen here appended.

Dimensions of the Two Specimens.	No. 1.	No. 2.		
	inches.	inches.		
Total length, including caudal, . .	17.75	10.05		
Length without caudal, . . .	14.65	8.30		
Greatest depth of body, . . .	4.50	1.96	$30\frac{1}{2}$	$23\frac{1}{3}$
Greatest thickness of body, . . .	2.38	.92	16	$10\frac{1}{2}$
Length of head, ...	3.74	2.08	25	$24\frac{2}{3}$
Circumference behind base of pectorals,	10.88			
Longitudinal diameter of eye, . .	.80	.52	$5\frac{1}{2}$	6
Length of snout, ...	1.25	.63	$8\frac{1}{2}$	$7\frac{1}{3}$
Interorbital width, round curve of forehead,	1.75	.76	12	9
From tip of snout to dorsal, along dorsal outline, ...	4.75	2.46	$32\frac{1}{2}$	$29\frac{1}{2}$
Length of base of dorsal fin, . . .	8.96	4.95		
" " " spinous dorsal, . .	2.40	1.25	16	$14\frac{2}{3}$
From tip of lower jaw to anal, along abdomen, ...	8.60	4.39	$54\frac{1}{2}$	$51\frac{1}{2}$
Length of base of anal, ...	5.02	3.32	40	40
Length of pectoral base, . . .	.87	.45		
Length of pectoral to tip of longest (7″) ray,	3.36	1.82	23	22
From tip of snout to insertion of ventrals,	4.46	2.42	$30\frac{1}{2}$	29
Length of ventrals, . . .	2.30	1.20	$15\frac{1}{2}$	14
Height of first dorsal spine, . . .	.25	.25	$1\frac{2}{3}$	3
" " second " " . . .	.56	.40	4	5
" " third " " . . .	.82	.55	$5\frac{5}{8}$	$6\frac{1}{2}$
" " fourth " " . . .	.93	.68	$6\frac{1}{3}$	7
" " fifth " " . . .	1.03	.70	7	$8\frac{1}{3}$
" " sixth " " . . .	1.05	.73	7.2	$8\frac{1}{2}$
" " seventh " " . . .	1.09	.75	$7\frac{1}{2}$	9
" " eighth " " . . .	1.13	.77	$7\frac{2}{3}$	$9\frac{1}{4}$
" " ninth " " . . .	1.10	.70	$7\frac{1}{2}$	$9\frac{1}{3}$
Distance from 1st dorsal to lateral line, .	1.50	.65	10	$7\frac{1}{2}$
Height of soft dorsal, in front, . .	1.30	.90	9	$10\frac{1}{2}$
Depth of anal, ...	1.30	.90	9	$10\frac{1}{2}$
Width of caudal peduncle, . . .	1.12	.65	$7\frac{2}{3}$	$7\frac{2}{3}$
Length of lower jaw, ...	1.62	.82	11	$9\frac{3}{4}$
" " maxillary, along its curve, .	1.50	.75	10	9
Rays of dorsal, ...	ix-26	ix-25		
" anal, ...	ii-25	ii-25		

Further Description of No. 1.—Snout very declivous, dorsal outline in advance of the dorsal rising rapidly, owing to a great accumulation of adipose tissue about the upper part of the body; posterior part of dorsal outline regularly descending almost in a straight line; abdominal outline regularly curved.

Greatest depth a little less than four times; head, $4\frac{3}{4}$ times in the total length; greatest thickness, $1\frac{8}{9}$ in the greatest depth. Eye, $4\frac{2}{4}\frac{7}{0}$; snout, 3, interorbital width (round curve of forehead), $2\frac{1}{7}$ times in the length of the head. Caudal peduncle, four times in the greatest depth. Distance from the spinous dorsal to the lateral line, measured along the curve of the side, one-third longer than the longest spine.

Denticulations of preoperculum rather blunt; opercular spine blunt.

Teeth somewhat irregular, canines less distinct than in the young.

Anal spines short and weak, but stiff, and distinctly recognizable as spines; the first very short, the second about half as long as the first ray.

Lateral line less conspicuous than in the young.

Upper part of the head and along the line of the back approaching a chocolate tint.

Vertical fins darker nearer the margin. No black spot above pectoral axil.

The whole fish is exceedingly oily, and the abundant exudation of this oil renders it exceedingly disagreeable to handle.

Further Description of No. 2.—Dorsal outline from tip of lower jaw to vertical from posterior margin of eye, much less convex than in the adult; rise from thence to the origin of the dorsal very slight; a gradual descent in an almost straight line from thence to the caudal peduncle. Abdominal outline regularly curved to caudal peduncle. Greatest depth, $5\frac{1}{8}$; length of head, $4\frac{5}{6}$ times in the total length; eye, 4 times; snout, about $3\frac{1}{3}$ times in the length of the head. Interorbital width, measured round its curve, about one-fifth more than the length of the snout, or $2\frac{5}{7}$ in the length of the head. Caudal peduncle, 3 times in the greatest depth.

Distance from the spinous dorsal, at its posterior part, to the lateral line, nearly $1\frac{1}{6}$ in the length of the longest spine, and less

than one-third of the semicircumference of the body. Longest (9th) dorsal spine, $2\frac{3}{5}$ in the length of the head.

Forehead and occiput transversely much less arcuate than in the adult, the large deposit of fat on these parts in the latter being absent in the young.

Opening of mouth slightly less oblique than in the adult, the maxillary extending a little farther back. Teeth much as in the adult, but the hindmost tooth in each jaw, but especially in the upper, assuming more distinctly the proportions of a canine, though still smaller than the front teeth.

Denticulations of operculum proportionately more conspicuous, and more acute than in the adult, opercular spine ending in three denticulations.

Ninth dorsal spine, $6\frac{1}{4}$ times in the length of the fin, about $2\frac{1}{2}$ in the greatest depth. Rays of soft dorsal about $2\frac{1}{6}$ in the greatest depth, the antepenultimate ray slightly produced. Anal spines closely attached to the first ray, very small, flexible, and scarcely recognizable as spines.

A black spot above the upper axil of the pectoral; upper parts without the warm tint of the adult. No large development of adipose tissue.

Since the above paper was written, a third specimen of *Caulolatilus* from the same locality has come into the possession of the California Academy of Sciences. This example is about equal in length to the larger of the two described, but the development of fat upon the occiput is much less marked, so that its proportions are very nearly those of the type of *C. anomalus*.

Although I am perfectly aware that specimens from the Galapagos would be required to settle the question of the identity of *C. princeps* with *C. anomalus* and *C. affinis*, I believe that the comparison of these three examples, evidently all of one species, and sharing among them characters relied upon as specific, certainly throws great doubt upon the distinctness of the three described species. Dr. Bean (*in lit.*) doubts the specific identity of the two specimens described in this paper, and draws attention to certain differences of proportion, but the only differences of magnitude are those caused by the development of fat on the occiput.